POLLUTION PREVENTION TRAINING INNOVATIONS AT ARNOLD AIR FORCE BASE

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This paper describes two related pollution prevention (P2) training initiatives underway at Arnold Air Force Base (AFB) aimed at equipping the workforce to identify reduction opportunities in the workplace. Developing innovative training and providing new educational opportunities to Base employees are of paramount importance in achieving additional reductions in hazardous material use and waste generation. A detailed account of both a recently developed computer-based opportunity assessment (OA) training package and a shop-level training approach under development is included.

Introduction

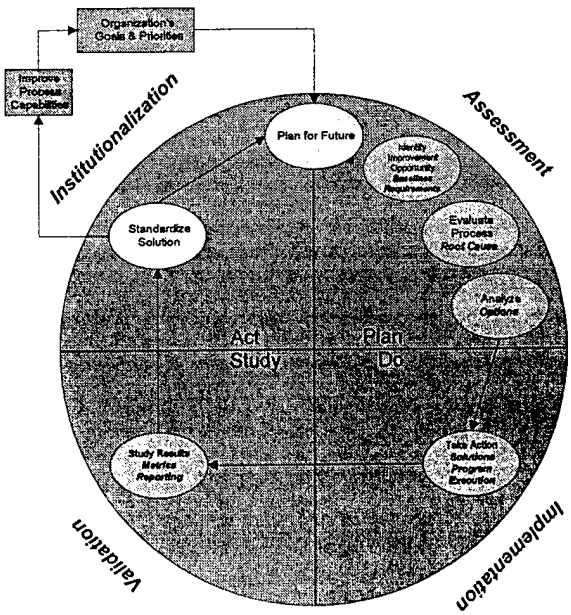
Arnold AFB is one of three test centers within the Air Force Materiel Command. Named for the first General of the Air Force, Henry H. "Hap" Arnold, it is situated on a 40,000-acre reservation in southern middle Tennessee. Arnold Engineering Development Center (AEDC), where the testing is conducted, encompasses a 3,600-acre industrial area. The Base population is 3,250, comprised of Air Force staff and two primary civilian contractors, Sverdrup Technology, Inc. (SvT) and Aerospace Center Support (ACS).

The Air Force staff, numbering around 300 and split equally between military and civilian personnel, provides management, resource allocation, and contract administration for the facility and its specialized operations. SvT is responsible for conducting propulsion and flight dynamics testing, while ACS serves as the center support contractor. Science Applications International Corporation (SAIC) provides additional specialized support to the Base environmental programs.

AEDC is the most advanced and largest complex of flight simulation test facilities in the world, with fifty-three aerodynamic and propulsion wind tunnels, rocket and turbine engine test cells, space environmental chambers, arc heaters, ballistic ranges, and other specialized units. Twenty-seven test units possess capabilities unmatched in the United States; thirteen are unmatched in the world. Facilities can simulate flight conditions from sea level to altitudes around 100,000 feet, and from subsonic velocities to those well over Mach 20.

Description of Pollution Prevention Program

AEDC has been actively involved in waste reduction efforts for a number of years. However, 1996 was a critical juncture in the P2 program. That year, a Strategic Plan was developed to guide the efforts of the P2 Integrated Product Team (IPT), which was formed that same year. One of the most critical decisions made in the early stages of the program was the adoption of a P2 process methodology, based on Air Force P2 guidance and the Quality Air Force (QAF) quality cycle. The methodology incorporated root cause analysis in the assessment phase of the process in an effort to better focus efforts on the "front of the pipe."



Following the vision of the Strategic Plan, and utilizing root cause principles in the investigation of reduction opportunities and subsequent development of P2 options,

a number of focused studies were conducted. This assessment effort addressed a number of major opportunity areas, including hazardous wastes, municipal solid wastes, and non-RCRA wastes (i.e., those wastes that are not regulated but cannot be disposed of on site). In addition, the Base-wide OA was updated last year to reflect the status of P2 efforts and identify additional improvement opportunities.

As part of the "fence-to-fence" OA update, SAIC was tasked with several other related initiatives, including the updating of an existing process material usage and waste generation database, the formatting of this information for input into the Geographic Information System (GIS), and the development of OA training for Base personnel. The latter was viewed as a means to more fully realize the benefits of P2 through institutionalizing P2 principles into Base operations. Furthermore, the effort to "operationalize" P2 is viewed as an important element in the Base meeting its strategic objectives to streamline business practices, increase efficiency, and reduce the overall cost of the testing process.

Purpose/Goal of Training

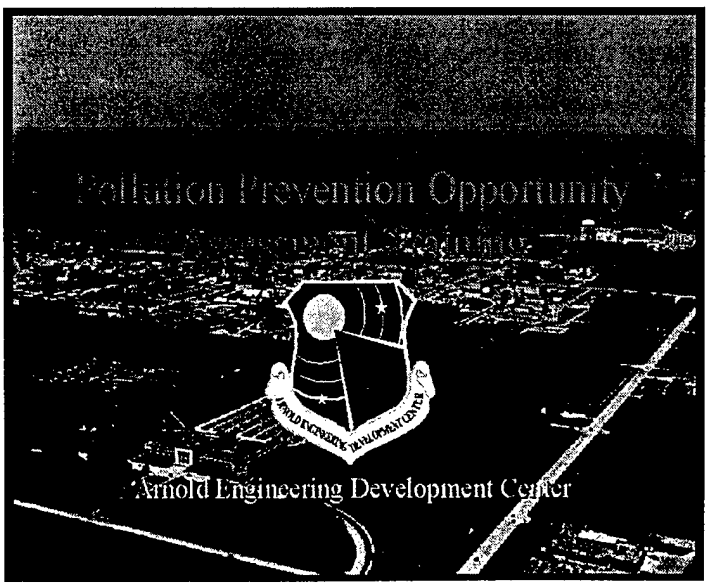
Effective training is a critical factor in implementing change within a process or an organization. In the workplace, it provides the means to disseminate needed information, and indoctrinate and educate employees on new concepts and new ways of doing things. When basic instruction is augmented with real-world applications, it serves to reinforce desired actions and behaviors and thus institutionalize change within the culture.

As pollution prevention is a concept of change - that being to find new and better ways of performing tasks to reduce inefficiencies and wastes - developing and applying effective P2 training initiatives can pay huge dividends. This is particularly true in light of the present financial constraints imposed by budgetary reductions and a very competitive marketplace.

P2 awareness training has been provided to Base employees in the past. To develop a fuller understanding of P2 and its potential benefits, additional training for the general population was felt to be in order. This training is directed at providing personnel a good understanding of P2, both historically and conceptually, as well as a good working knowledge of the OA process (i.e., what is the thought process, what are the basic steps, etc.). Additionally, more in-depth, hands-on instruction was felt to be in order for employees engaged in particular Base activities. Thus, an effort to develop and conduct shop-level P2 training for selected operations has been initiated.

Phase I - Opportunity Assessment Training

At the outset, it was recognized that the audience would be quite varied, from new hires to seasoned veterans, from clerical staff to testing engineers to maintenance mechanics, and that the core knowledge of Base employees pertaining to environmental matters would range from very knowledgeable to nonexistent. As such, it was deemed crucial that the presentation approach offer as much flexibility as possible.



After careful consideration, the decision was made to develop the training as animated, interactive Power Point slide shows with embedded WAV files providing full narration. This format offers considerable flexibility in providing instruction to virtually any audience. For instance, the files can be placed on a server

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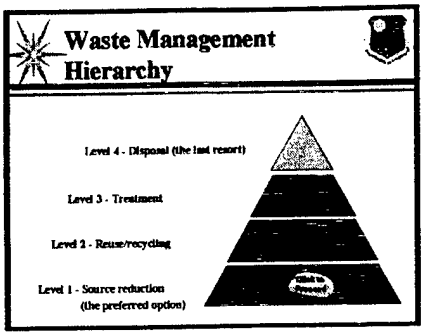
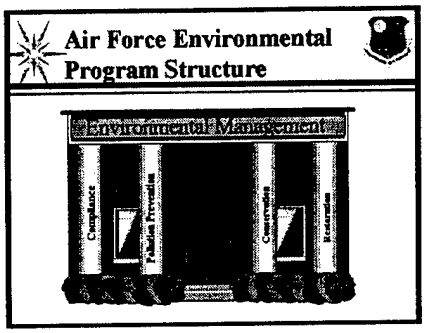


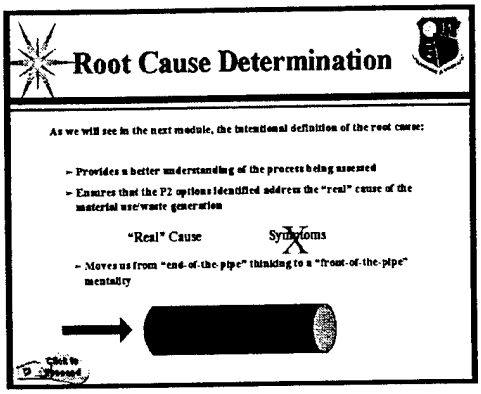
Core Module 1 – History of Pollution Prevention

To provide the student with an historical perspective of P2, the first core module deals with the history of pollution prevention. Topics include population growth and technological advancements, early legislation enacted to address pollution, industry's realization that "front-of-the-pipe" initiatives save money, the passage of the Pollution Prevention Act of 1990, and the waste management hierarchy.

Core Module 2 - Air Force Pollution Prevention Strategy



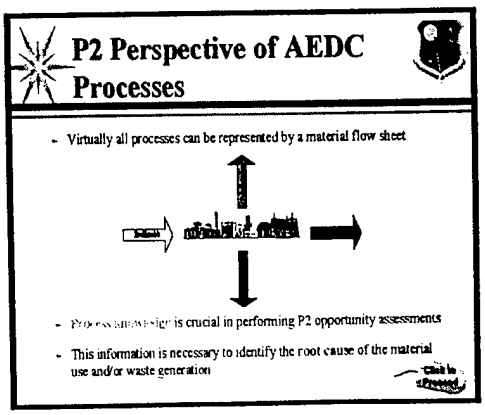
To provide an understanding of how and when Air Force P2 initiatives came into being, Module 2 provides a brief overview of the Air Force P2 Program. The basic four-pillar structure of the Air Force environmental program is discussed, as is its P2 strategy. In addition, metric reduction goals for major protocol areas (e.g., solid wastes) are reviewed. The student is also introduced to the P2 process methodology, or pollution prevention opportunity assessment (PPOA) process.



Core Module 3 - AEDC Pollution Prevention Program

The OA training package also provides an overview of AEDC's P2 Program and illustrates how it supports the mission and vision of the Base. The topic of "compliance through P2" is discussed, and the concept of root cause analysis is introduced as a means to more effectively target "front-of-the-pipe" solutions, identify additional waste reduction opportunities, and develop effective P2 options that address the real reason(s) that toxic materials are used and wastes are generated. In preparation for a more in-depth discussion of the OA process in the next module, Module 3 closes with a brief overview of the four quadrants of the AEDC P2 process cycle.

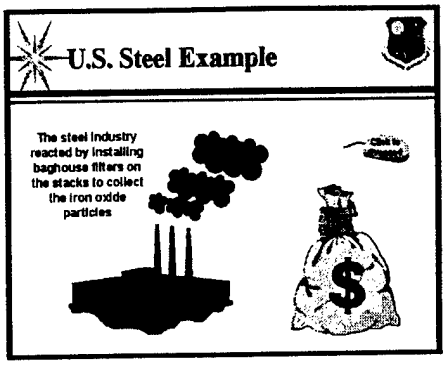
Core Module 4 - The Pollution Prevention Opportunity Assessment

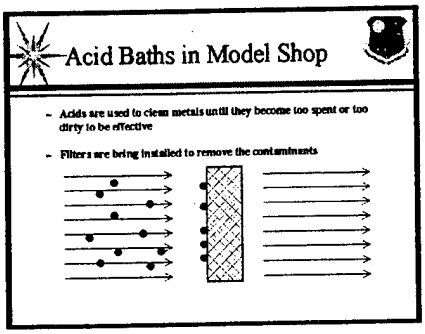


While the previous modules provide the background and rationale for pollution prevention efforts, Module 4 provides the student with specific information on the OA process itself. As it is the focus of the training, it is much more detailed and of longer duration than previous modules. The module begins with a brief overview of the material life cycle and how to construct flow sheets describing a given process. Following a review of the AEDC P2 process cycle, each of the six steps in the assessment phase is described in detail. Criteria to consider, questions to ask oneself, and the importance of identifying root causes for the use of toxic materials and the generation of wastes are covered. Generic categories of potential P2 options are reviewed to stimulate the student's thinking. In addition, criteria

for evaluating options are discussed, such as the technical and economic feasibility of initiatives. Finally, information pertaining to the formal prioritization of projects for funding consideration is covered, along with an overview of the P2 project funding cycle.

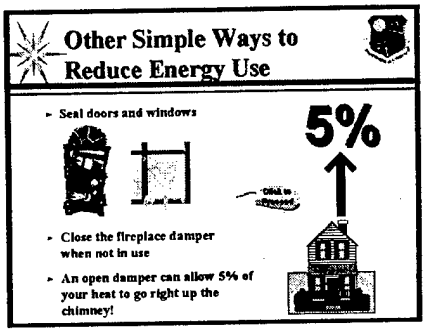
In closing, the value of root cause determination is illustrated through a real-life example – a case study from United States Steel. This example serves as a backdrop for the next module, which deals with P2 success stories from the military, from AEDC, and from private industry.





Core Module 5 - Examples of Pollution Prevention Successes

As mentioned in the preceding section, Module 5 provides a number of real-life successes stemming from the effective application of P2 principles in a variety of circumstances. Military and industrial operations are covered, including a number of local success stories.



Summary Module

In addition to providing a review of some of the key points covered in the training, the summary module provides examples of how to apply P2 at home. An emphasis is placed on recycling and energy/water conservation. As the module closes, information pertaining to Base P2 points of contact and the availability of a P2 information package is provided.

Pollution Prevention Opportunity Assessment Training for AEDC is currently available on CD-ROM for Office 95 use. An Office 97 training package is being prepared at the present time. In addition, it is planned to place the training package on the Base environmental server once a proposed memory upgrade is completed. All Base employees will be provided the opportunity to receive this training.

Phase II - Shop-Level Pollution Prevention Training

As a follow-on project to the Phase I effort, and a logical progression in the continuous improvement process, shop-level P2 training is being developed for specific target audiences to reinforce and expand the concepts presented in previous training initiatives. This training will provide hands-on instruction to effectively demonstrate how to identify and assess waste reduction opportunities in the workplace. The target audience for this training is Base personnel involved in those activities determined to be key waste reduction opportunity areas. This determination will be based on AEDC experience and available metric information from various sources, such as the process database described earlier.

The shop-level effort will involve the development of P2 reference manuals and facilitation of their use within the workforce. Previously prepared training materials (e.g., OA training modules) will be utilized to the extent possible to both maintain consistency and reduce development costs. The manuals will contain the following information:

- Refresher instruction on P2 concepts and assessing P2 opportunities - *Generic*
- Tools for conducting opportunity assessments (i.e., flowsheets and checklists) – *Generic*

- Process-specific information (e.g., quantities of hazardous materials in use) – ***Shop-specific***
- Pertinent P2 successes from AEDC, other military installations, and/or industry – ***Shop-specific***
- A listing of P2 reference sources - ***Generic***

As indicated above, P2 tools and references are being developed in the course of this work. This information contained in the P2 reference manuals will be generic to all shops and/or activities. As such, this information can be incorporated into subsequent manuals, thereby allowing the preparation of additional manuals at a smaller incremental cost than would otherwise be the case. This will provide for the timely preparation of additional training materials as Base priorities and available resources dictate.

Once manuals are prepared for a targeted shop, an instructional session will be held with shop personnel following a generic lesson plan. These sessions will provide an opportunity to conduct the following:

- Discuss the purpose and application of the manual
- Review basic P2 concepts and the OA process
- Review case studies to enhance understanding of basic principles
- Review P2 tools included in the manual and discuss their application
- Facilitate student participation in example exercises (preferably ones that have particular significance to the involved shop)
- Review related P2 successes and P2 reference sources

It is envisioned that these sessions will consist of several brief presentations, each of which will be followed by exercises, with environmental staff members and/or prior "graduates" of the course serving as facilitators.

As a means to "hold the gains" and ensure that momentum is maintained, it has been proposed to hold periodic "alumni" meetings of personnel who have completed shop-level training, to provide a forum for reporting and comparing results, sharing lessons learned, and discussing common issues of interest. Also, recognition of employees who make the effort to put their newfound knowledge into practice is seen as a high priority to further energize the program.

Summary

As a companion effort to the recent Base-wide OA update, AEDC has developed a Power Point-based training package, providing the capability to offer both individualized instruction via interactive PC-based slide shows, and group instruction via computer or conventional overhead projection. In addition, to reinforce the concepts presented, shop-level training that will provide hands-on application of P2 principles is being developed.

By integrating innovative instructional techniques with field exercises, and placing user-friendly OA tools in the hands of Base personnel most knowledgeable of shop operations and processes, Arnold Air Force Base is striving to achieve its stated environmental vision, "a model of environmental excellence."

Arnold Engineering Development Center

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